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| APPLICATION NO.   | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|----------------------|---------------------|------------------|
| 09/504,660  | 02/14/2000  | William E. Hoke      | 07206-047001        | 8160             |
| 22494   | 7590        | 04/13/2004           |                     | EXAMINER         |
| DALY, CROWLEY & MOFFORD, LLP<br>SUITE 101<br>275 TURNPIKE STREET<br>CANTON, MA 02021-2310 |             |                      |                     | KANG, DONGHEE    |
|   |             |                      | ART UNIT            | PAPER NUMBER     |
|   |             |                      | 2811                |                  |

DATE MAILED: 04/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

|                              |                 |          |              |
|------------------------------|-----------------|----------|--------------|
| <b>Office Action Summary</b> | Application No. | 6        | Applicant(s) |
|                              | 09/504,660      |          | HOKE ET AL.  |
|                              | Examiner        | Art Unit |              |
|                              | Donghee Kang    | 2811     |              |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 20 January 2004.
- 2a) This action is **FINAL**.                            2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 9-15 and 18-34 is/are pending in the application.
- 4a) Of the above claim(s) 9-15 is/are withdrawn from consideration.
- 5) Claim(s) 18-30 is/are allowed.
- 6) Claim(s) 31 and 32 is/are rejected.
- 7) Claim(s) 33-34 is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) All    b) Some \* c) None of:
  1. Certified copies of the priority documents have been received.
  2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- 1) Notice of References Cited (PTO-892)
- 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) Notice of Informal Patent Application (PTO-152)
- 6) Other: \_\_\_\_\_

## DETAILED ACTION

### ***Acknowledgment***

1. Claims 9-15 & 18-34 are pending in this application. However, claims 9-15, non-elected invention, are withdrawn from further consideration.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims **31-32** are rejected under 35 U.S.C. 103(a) as being unpatentable over Hur et al (Ultralinear Doubled Pulse doped AlInAs/GaAs/InP HEMTs", Electronic Lett., IEEE Stevenage, GB, Vol.32, No.16, August 1, 1996, pages 1516-1518) in view of Ando (JP08-55979).

Regarding claim 31, Hur et al. teach a transistor, comprising (Fig.1):

a semi-insulating indium phosphide (InP) substrate; a channel layer of GaInAs disposed over the substrate layer; a Schottky layer of AlInAs disposed over the channel layer; a resistive layer (undoped-GaInAs) disposed over the Schottky layer; a contact layer (doped-GaInAs) disposed over the resistive layer, the contact layer having a first recess, and the resistive layer having a second recess; a source electrode in ohmic contact with the contact layer (doped-GaInAs); a drain electrode in ohmic contact with the contact layer; and a gate electrode in Schottky contact with the Schottky layer.

Hur et al. do not teach the Schottky layer having a recess. However, Ando in Fig.9 teaches the Schottky layer (96) having a recess to obtain a stable device characteristic since an electric field generated by the applied voltage through the gate can be alleviated, which results in the lowered rate of impact ionization of the channel electrons. This also contributes the reduction of the parasitic capacitance between the gate and the cap layer, leading to an increase in the power gain of the device. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to form recess in the Schottky layer as taught by Ando in the Hur's device since it contributes the reduction of the parasitic capacitance between the gate and the cap layer, leading to an increase in the power gain of the device.

Regarding claim 32, Hur et al. as modified by Ando teach the transistor further comprising a first doped layer and a second doped layer (Si pulse).

***Allowable Subject Matter***

4. Claims 33-34 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: Prior art reference, taken along or in combination, do not teach or render obvious that a ratio of silicon doping concentration approximately 2.5 to 1.5 between the first doped layer and the second doped layer or the resistive layer comprising  $Al_{0.48}In_{0.52}As$ .

5. Claims 18-30 are allowed.

The following is an examiner's statement of reasons for allowance:

Prior art reference, taken along or in combination, do not teach or render obvious that the lattice constants of the channel layer and lattice constant of the Schottky layer is different from the lattice constant of the substrate and a difference between conduction band levels of the channel and Schottky layers is larger than when the channel and Schottky layers has the same lattice constant as the substrate.

***Response to Arguments***

6. Applicant's arguments filed January 20, 2004 have been fully considered but they are not persuasive.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Ando teaches that forming a recess in the Schottky layer would alleviate an electric field generated by the applied voltage through gate electrode so as to lower rate of impact ionization of the channel electrons. This also contributes the reduction of the parasitic capacitance between the gate and the cap layer, leading to an increase in the power gain of the device. Therefore, forming a recess in Schottky layer of Hur as taught by Ando would

reduce the electric field and the parasitic capacitance hence obtaining a stable device characteristic.

***Conclusion***

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Donghee Kang whose telephone number is 571-272-1656. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

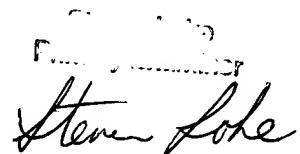
Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

dhk

A handwritten signature in black ink, appearing to read "Steven Loke".